

# The Minimally Invasive Era

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The management of organ-confined neoplastic prostate disease has dramatically evolved during the past two decades, following the introduction of new mass screening methods, innovative transrectal ultrasound systems, and improved surgical and nonsurgical therapies. Combining these modern tools with early detection of the disease, prostate adenocarcinoma is no longer considered to be a life-threatening disease for the majority of affected men.

Historically since 1901 when Proust described the first radical prostatectomy (RP), the search for less invasive and less morbid surgical techniques has continued. Although the technique was well documented by Young in 1904 with his RP series, it remained a major surgical event for the patient, with significant morbidity accompanied by impotence and a long period of rehabilitation. It was not until the early 1980s when Walsh and colleagues described their nerve-sparing surgical approach that this surgery became more appealing to a population of younger patients with prostate cancer. The development of laparoscopy during the late 1980s and early 1990s further pushed the envelope, and new ideas were frequently presented at various medical meetings. As surgical procedures were being refined, innovative concepts for minimally invasive procedures were simultaneously being introduced.

In the early 1960s the first cryosurgery was performed with equipment that utilized liquid nitrogen as the cryogen. The first devices used funnels through which liquid nitrogen was poured. This method was subsequently replaced by an FDA-approved system that pumped liquid nitrogen through larger diameter probes. Due to difficulties in controlling the size of the iceball and its freezing characteristics, this equipment and its application required a high degree of skill. Even when performed by skilled professionals, however, a high rate of significant complications and adverse effects were reported. In the mid 1990s, a second-generation cryosurgery system emerged, based on an advanced gas expansion method (Joule-Thomson principle). Although these systems significantly improved the controlling of the freezing process, the probes (3.2 mm in diameter) were large and inserted in a cumbersome fashion requiring the use of a special insertion kit. The system supported a maximum of eight probes simultaneously, resulting in low

accuracy, poor controllability, and a lack of uniform distribution of lethal temperatures. Based on the success of the template-guided insertion technique, in the late 1990s a third-generation cryotherapy system, which used the Joule-Thomson gas expansion principle with needle-like probes (CryoNeedles™, Oncura, Inc., Plymouth Meeting, PA), was introduced. Using this system, the 17-gauge (1.47 mm in diameter) CryoNeedles provided physicians with a system specifically designed for direct percutaneous insertion using a very familiar brachytherapy-like protocol.

Simultaneously with the cryosurgical developments, refinements to implanting radioactive I-125 (Iodine-125) sources inside the body to eradicate cancer were being made. Improvements in implanting radioactive sources continued throughout the 1970s and early 1980s in efforts to insert and evenly distribute the radioactive seeds without performing open surgery. In the early 1980s

using an early form of a transrectal ultrasound, Dr Hans Holm from the University of Copenhagen inserted radioactive seed-bearing needles through the perineum into the prostate. During the next few years, further refinement took place and in 1985, the first transrectal ultrasound and template-guided prostate brachytherapy procedure was performed. During the 1990s, further technological improvements occurred, notably the introduction of RAPID Strand™ (Oncura, Inc., Plymouth Meeting, PA), which facilitated the achievement of planned radiation delivery. Numerous clinical studies validating the success of brachytherapy have now been published and this effective minimally invasive procedure is routinely used to treat patients with prostate cancer.

The merging of this search for less morbid and less invasive therapies with the explosion in medical information, specifically from the Internet, consumer-driven marketing programs,

insurance reimbursement plans, and even industry research and development has resulted in a strong movement within the urologic oncology community toward developing and implementing even more minimally invasive diagnostic procedures as well as therapies. The goals of these minimally invasive therapies designed for the treatment of neoplastic prostate disease are as follows; 1) eradicate in situ local disease, 2) shorten the hospital stay, 3) limit postoperative morbidities, 4) shorten the time to return to daily functions and work, and 5) reduce the overall cost of the procedure.

Patients are increasingly demanding minimally invasive treatment options, and practicing urologists should familiarize themselves with these emerging modalities. The purpose of this supplement is to present the cumulative experience with brachytherapy and cryotherapy, the two leading minimally invasive treatment modalities available and used today. ■